

REMARKS

Claims 1-14 and 28-47 were pending in the application at the time the present Office Action was mailed, claims 12-14 and 37 having been withdrawn pursuant to an earlier Restriction Requirement. Claims 36 and 45 have been amended, and new claims 48-52 have been added. Accordingly, claims 1-14 and 28-52 are currently pending, and claims 1-11, 28-36 and 38-52 are currently under consideration.

In the July 26, 2006 Office Action, claims 1-11, 28-36 and 38-47 were rejected. More specifically, the status of the application in light of this Office Action is as follows:

- (A) Claims 7, 36 and 45 stand rejected under 35 U.S.C. § 112, second paragraph;
- (B) Claims 1, 6-10, 28-30, 33, 36, 38-42 and 44-45 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,703,310 to Mashino et al. ("Mashino");
- (C) Claim 2 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of U.S. Patent No. 7,045,015 to Renn et al. ("Renn");
- (D) Claims 3, 31, 34 and 46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of U.S. Publication No. 2004/0023447 to Hirakata et al. ("Hirakata");
- (E) Claims 4, 32, 35 and 47 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of U.S. Publication No. 2004/0087441 to Bock et al. ("Bock");
- (F) Claim 5 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of U.S. Patent No. 6,828,223 to Chuang. ("Chuang"); and
- (G) Claim 43 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of applicants' Admitted Prior Art ("APA").

A. Response to the Section 112 Rejections

The Office Action maintains that the specification provides insufficient antecedent basis for the "laser drilling" feature of claim 7. More specifically, the Office Action states that the specification discloses "suitable drilling methods," but is silent regarding "laser drilling." Applicants respectfully disagree. In paragraph 27 of the specification, for example, it states "... the passage 342 can be formed using a laser-cutting method at least generally similar to one or more of the methods described in co-pending U.S. Patent Application No. 10/713,878" For at least this reason, applicants submit that the specification provides sufficient antecedent basis for "laser drilling." Therefore, the Section 112 rejection of claim 7 should be withdrawn.

Claims 36 and 45 were rejected under 35 U.S.C. § 112, second paragraph, because of a lack of support in the specification for: "an insulated layer deposited in the passage between the first and second conductive materials." Claims 36 and 45 have been amended without commenting on or conceding the merits of this rejection. In view of these amendments, the Section 112 rejection of claims 36 and 45 should be withdrawn.

B. Response to the Section 102(e) Rejections

Claims 1, 6-10, 28-30, 33, 36, 38-42 and 44-45 were rejected under 35 U.S.C. § 102(e) as being anticipated by Mashino. The standard for anticipation under Section 102 requires that each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. (MPEP § 2131). As explained in greater detail below, however, Mashino fails to disclose or suggest each and every element as set forth in these claims.

1. Claim 1 is Directed to a Method of Forming a Conductive Interconnect in a Microelectronic Device that Includes, *inter alia*, Forming a Conductive Plug in a Passage Adjacent to a First Side of a Microelectronic Workpiece

Claim 1 is directed to a method of forming a conductive interconnect in a microelectronic device. The method includes, *inter alia*, forming a passage extending through a microfeature workpiece from a first side of the workpiece to a second side of the workpiece. The method further includes forming a conductive plug in the passage adjacent to the first side of the

workpiece, and depositing conductive material in the passage to at least generally fill the passage from the conductive plug to the second side of the workpiece.

2. Mashino Discloses a Semiconductor Device Having a Conductive Film on the Inner Walls of a Through Hole

As shown in Figure 1B of Mashino, this reference discloses a semiconductor device having a silicon substrate 201 with a through hole 212. Insulating film 209 is formed on the inner walls of the through hole 212, and a conductive film referred to as an "interconnection pattern 214" is formed on the insulating film 209. As Mashino states, "In the illustrated example, the through hole 212 is hollow, but as shown in Figure 7, it is also possible to fill the through hole 212 with a conductor 217 electrically connected with the interconnection pattern 214." (Mashino, in column 6, at lines 3, 4 and 44-67; and column 7, at lines 25-28).

3. Mashino Cannot Support a Section 102 Rejection of Independent Claim 1 for at Least the Reason that this Reference Fails to Disclose or Suggest Forming a Conductive Plug in a Passage Adjacent to a First Side of a Microelectronic Workpiece, and Depositing Conductive Material in the Passage to at Least Generally Fill the Passage From the Conductive Plug to a Second Side of the Workpiece

The method of claim 1 includes, *inter alia*, forming a passage from a first side of a microfeature workpiece to a second side of the workpiece, and forming a conductive plug in the passage adjacent to the first side of the workpiece. The method further includes depositing conductive material in the passage to at least generally fill the passage from the plug to the second side of the workpiece. Applicants respectfully submit that Mashino fails to disclose or suggest, at least, forming a conductive *plug* in a passage in a microfeature workpiece. In addition, Mashino also fails to disclose or suggest filling the passage *from the conductive plug* to a side of the workpiece.

The Office Action suggests that the conductive film or "interconnection pattern 214" shown in Figure 7 of Machino can somehow be construed as the "conductive plug" of claim 1. (Office Action at page 3, para. 3.) Applicants respectfully disagree, however, because Mashino clearly teaches that the interconnection pattern 214 does not *plug* the through hole 212. To the contrary, as unmistakably illustrated in Figures 1B and 7, the interconnection *pattern* 214 is only

formed on the inner walls of the through hole 212. Accordingly, the interconnection pattern 214 does not *plug* the through hole 212.

The fact that the interconnection pattern 214 does not plug the through hole 212 is further evidenced by the explicit statement in Mashino that "the through hole 212 is hollow" *after* the interconnection pattern 214 is applied. (Mashino in column 7 at lines 25 and 26). Although Figure 7 of Mashino shows that it is also possible to fill the through hole 212 with a conductor 217, the interconnection pattern 214 still remains on the side walls of the through hole 212 only, and does not form *a plug* in the through hole 212.

As is well known, the common meanings of "a plug" include "*1. An object, such as a cork, used to fill a hole tightly; a stopper. 2. A dense mass of material that obstructs a passage.*" (The American Heritage College Dictionary, Third Edition). Each of the conductive plug embodiments described and illustrated in the present application are consistent with these definitions. In contrast, nowhere does the interconnection *pattern* 214 of Mashino "fill" the through hole 212 "tightly," or act as "a stopper" or a dense mass of material that "obstructs" the through hole 212. Accordingly, Mashino cannot support a Section 102 rejection of claim 1 for at least the reason that this reference fails to disclose or suggest forming a conductive plug in a passage in a microfeature workpiece. Therefore, the rejection of claim 1 should be withdrawn.

Claims 6-10 depend from base claim 1. Accordingly, Mashino cannot support a Section 102 rejection of dependent claims 6-10 for at least the reason that this reference cannot support a Section 102 rejection of corresponding base claim 1, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 6-10 should be withdrawn.

Independent claim 28 is directed to a packaged microelectronic device that includes features at least generally similar to features described above with reference to claim 1. For example, the device of claim 28 includes, *inter alia*, a passage extending completely through a die, and a first conductive material deposited in a first portion of the passage adjacent to a first side of the die to form a conductive plug. The device of claim 28 further includes a second conductive material deposited in a second portion of the passage in contact with the conductive plug to at least generally fill the passage from the conductive plug to a second side of the die.

As discussed above with reference to the rejection of claim 1, Mashino fails to disclose or suggest, at least, a first conductive material forming a conductive *plug* in a passage, and a second conductive material at least generally filling the passage *from the conductive plug* to a second side of the die. Therefore, Mashino cannot support a Section 102 rejection of claim 28 and the rejection should be withdrawn.

Claims 29 and 30 depend from base claim 28. Accordingly, Mashino cannot support a Section 102 rejection of dependent claims 29 and 30 for at least the reason that this reference cannot support a Section 102 rejection of corresponding base claim 28, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 29 and 30 should be withdrawn.

Independent claim 33 is directed to a microfeature workpiece that includes, *inter alia*, features at least generally similar to those discussed above with reference to claim 1. For example, the microfeature workpiece of claim 33 includes, *inter alia*, a passage extending completely through a die from a first side of a microfeature workpiece to a second side of the microfeature workpiece. The microfeature workpiece further includes a first conductive material deposited in a first portion of the passage adjacent to the first side of the microfeature workpiece *to form a conductive plug*. In addition, the microfeature workpiece also includes a second conductive material deposited in a second portion of the passage in contact with the conductive plug to at least generally fill the passage *from the conductive plug* to the second side of the microfeature workpiece. For at least the reasons set forth above with reference to independent claims 1 and 28, applicants submit that Mashino fails to disclose or suggest, at least, the first and second conductive materials of claim 33. Therefore, the rejection of claim 33 should be withdrawn.

Claims 36 and 38 depend from base claim 33. Accordingly, Mashino cannot support a Section 102 rejection of dependent claims 36 and 38 for at least the reason that this reference cannot support a Section 102 rejection of corresponding base claim 33, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 36 and 38 should be withdrawn.

Independent claim 39 is directed to a microelectronic device set that includes a first microelectronic device having, *inter alia*, features that are at least generally similar to features discussed above with reference to claim 1. The features include, *inter alia*, a first conductive material deposited in a first portion of a passage *to form a conductive plug*, and a second conductive material deposited in a second portion of the passage *in contact with the conductive plug* to at least generally fill the passage. For at least the reasons set forth above, applicants submit that Mashino fails to disclose or suggest these features. Therefore, the rejection of claim 39 should be withdrawn.

Claims 41 and 42 depend from base claim 39. Accordingly, Mashino cannot support a Section 102 rejection of dependent claims 41 and 42 for at least the reason that this reference cannot support a Section 102 rejection of corresponding base claim 39, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 41 and 42 should be withdrawn.

Independent claim 44 is directed to a microelectronic device set that includes, *inter alia*, features at least generally similar to the features discussed above with reference to independent claim 39. Therefore, claim 44 distinguishes over the Mashino reference for at least the reasons discussed above with reference to independent claim 39, and the rejection of claim 44 should be withdrawn.

Claim 45 depends from base claim 44. Accordingly, Mashino cannot support a Section 102 rejection of dependent claim 45 for at least the reason that this reference cannot support a Section 102 rejection of corresponding base claim 44, and for the additional features of this dependent claim. Therefore, the rejection of dependent claim 45 should be withdrawn.

C. Response to the Section 103(a) Rejections under Mashino and Renn

Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of Renn. Claim 2 depends from base claim 1. As discussed in detail above in paragraph B, Mashino fails to disclose or suggest each and every element as set forth in claim 1. Furthermore, Renn fails to cure the deficiencies of Mashino with respect to claim 1. Accordingly, the combination of Mashino and Renn cannot support a Section 103 rejection of dependent claim 2

for at least the reasons that these references cannot support a Section 103 rejection of corresponding base claim 1, and for the additional features of this dependent claim. Therefore, the rejection of dependent claim 2 should be withdrawn.

D. Response to the Section 103(a) Rejections under Mashino and Hirakata

Claims 3, 31, 34 and 46 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of Hirakata. Claim 3 depends from base claim 1, claim 31 depends from base claim 28, claim 34 depends from base claim 33, and claim 46 depends from base claim 44. As discussed in detail above in paragraph B, Mashino cannot support a Section 102 rejection of base claims 1, 28, 33 and 45 for at least the reason that this reference fails to disclose or suggest each and every element as set forth in these claims. Furthermore, Hirakata fails to cure the deficiencies of Mashino with regard to base claims 1, 28, 33 and 45. Accordingly, the combination of Mashino and Hirakata cannot support a Section 103 rejection of dependent claims 3, 31, 34 and 46 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claims 1, 28, 33 and 45, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 3, 31, 34 and 46 should be withdrawn.

E. Response to the Section 103(a) Rejections under Mashino and Bock

Claims 4, 32, 35 and 47 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of Bock. Claim 4 depends from base claim 1, claim 32 depends from base claim 28, claim 35 depends from base claim 33, and claim 47 depends from base claim 44. As discussed in detail above in paragraph B, Mashino cannot support a Section 102 rejection of base claims 1, 28, 33 and 44 for at least the reason that this reference fails to disclose or suggest each and every feature as set forth in these claims. Furthermore, Bock fails to cure the deficiencies of Mashino with respect to base claims 1, 28, 33 and 44. Accordingly, the combination of Mashino and Bock cannot support a Section 103 rejection of dependent claims 4, 32, 35 and 47 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claims 1, 28, 33 and 44, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 4, 32, 35 and 47 should be withdrawn.

F. Response to the Section 103(a) Rejections under Mashino and Chuang

Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of Chuang. Claim 5 depends from base claim 1. As set forth above in paragraph B, Mashino fails to disclose or suggest each and every element as set forth in claim 1. Furthermore, Chuang fails to cure the deficiencies of Mashino with respect to base claim 1. Therefore, the combination of Mashino and Chuang cannot support a Section 103 rejection of dependent claim 5 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claim 1, and for the additional features of this dependent claim. Therefore, the rejection of dependent claim 5 should be withdrawn.

G. Response to the Section 103(a) Rejections under Mashino and APA

Claim 43 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of the APA. Claim 43 depends from base claim 39. As set forth in detail above in paragraph B, Mashino fails to disclose or suggest each and every element as set forth in base claim 39. Furthermore, the APA fails to cure the deficiencies of Mashino with respect to base claim 39. Accordingly, the combination of Mashino and the APA cannot support a Section 103 rejection of dependent claim 43 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claim 39, and for the additional features of this dependent claim. Therefore, the rejection of dependent claim 43 should be withdrawn.

H. New Claims 48-52

New claims 48-52 depend from base claims 1, 28, 33, 39 and 44, respectively. New claim 48, for example, is directed to the method of claim 1, and further comprises applying a passivation layer to at least a portion of the passage before forming the conductive plug in the passage. Claim 48 goes on to state that "depositing conductive material in the passage to at least generally fill the passage includes depositing the conductive material *in contact with the conductive plug and the passivation layer*." Dependent claims 49-52 include features at least generally similar to claim 48. Even accepting (and applicants expressly do not) that the interconnection pattern 214 of Mashino could somehow be construed as "a plug," nowhere does Mashino disclose or suggest depositing conductive material in the passage in contact with the interconnection pattern 214 and a

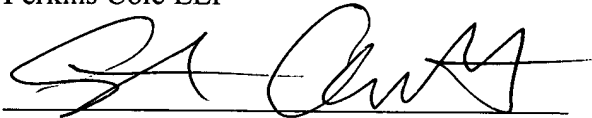
passivation layer. Accordingly, applicants respectfully submit that new claims 48-52 are allowable over Mashino for at least this reason.

Conclusion

In view of the foregoing, the claims pending in the application comply with 35 U.S.C. § 112 and patentably define over the applied art. Therefore, a Notice of Allowance is respectfully requested. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-6351.

Respectfully submitted,

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